

CLAIMS

1. Device for detecting by photoexcitation, a chemical element in a host substance, comprising:

5 - an optical excitation source consisting of a semi-conductor laser, emitting in the direction of a substance sample, a light beam whereof the wavelength, located in the mid infrared, corresponds to an absorption band specific of said element; and

10 - the means for detecting and measuring the heating effects of the host substance, resulting from the interaction of the element molecules excited by said beam with said host substance molecules,
characterised in that the said source of excitation is a quantum cascade laser.

15 2. Device according to claim 1, characterised in that the said means for detecting and measuring, respond to the pressure wave generated by heating the host substance, to produce a representation of the concentration of said element in said substance.

20 3. Device according to claim 2, characterised in that the said means comprise a microphone.

25 4. Device according to claim 1, characterised in that the said means for detecting and measuring respond to the variation in the index of refraction of the host substance, due to the pressure wave generated by the heating thereof, in order to produce a representation of the concentration of said element in said substance.

30 5. Device according to claim 4, characterised in that the said means comprise a source of light emitting a beam, which crosses said sample and the means of measuring the deflection of said beam, which results from the change in refraction index of the host substance.

6. Device according to claim 1, characterised in that said means for detecting and measuring respond to the variation in the index of refraction of the host substance, resulting from the heating thereof, to produce a representation of the concentration of said element in said substance.

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7. Device according to claim 6, characterised in that the said means comprise a source of light emitting a sounding beam which crosses said sample in a co-linear manner in relation to the excitation beam and also comprise a means of measuring the enlargement of the sounding beam

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resulting from the change in the refraction index of the host substance.

8. Device according to any of the claims 1 to 7, characterised in that it also comprises an enclosure to receive said sample.

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9. Device according to any of the claims 2 to 8, characterised in that the enclosure is smaller than the acoustic wavelength at excitation frequency.

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10. Device according to any of the claims 2 to 8, characterised in that the enclosure is of such dimension as to accommodate the acoustic modes resonating at excitation frequency.

11. Device for detecting by photoexcitation, a chemical element in a host substance comprising:

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- a source of optical excitation consisting of a semi-conductor laser which, in the direction of the sample of said substance, emits a beam of light, the wavelength of which, located in the mid infrared, corresponds to an absorption band specific to said element; and
- the means for detecting and measuring the heating effects of the host substance, resulting from the interaction of the element molecules excited by said beam, with said host substance molecules,

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characterised in that said source of excitation is a type II quantum well laser.

12. Device for detecting by photoexcitation, a chemical element in a host substance comprising:

- a source of optical excitation consisting of a semi-conductor laser which, in the direction of the sample of said substance, emits a beam of light, the wavelength of which, located in the mid infrared, corresponds to an absorption band specific to said element; and
- the means for detecting and measuring the heating effects of the host substance, resulting from the interaction of the element molecules excited by said beam, with said host substance molecules,

10 characterised in that said source of excitation is a type II quantum cascade laser.

13. Device for detecting by photoexcitation, a chemical element in a host substance comprising:

- a source of optical excitation consisting of a semi-conductor laser which, in the direction of the sample of said substance, emits a beam of light, the wavelength of which, located in the mid infrared, corresponds to an absorption band specific to said element; and
- the means for detecting and measuring the heating effects of the host substance, resulting from the interaction of the element molecules excited by said beam, with said host substance molecules,

20 characterised in that said source of excitation is a quantum well laser using materials with low forbidden band energy.